I S S U A N C E T R A N S M I T T A L
S H E E T

N A S A
National Aeronautics and
Space Administration

George C. Marshall Space Flight Center
Marshall Space Flight Center, Alabama 35812

|Issuance Number: MM 5330.10 Date: JULY 7, 1993

Material Transmitted:

1. Management Manual MM 5330.10, "MSFC Nonconformance (Discrepancy) Reporting System"

2. This manual is designed to:

a. Describe the forms and procedures used in the MSFC internal nonconformance reporting system;

b. Supplement the requirements of MMI 5330.8, "MSFC Nonconformance (Discrepancy) Review System," and MMI 5330.9, "MSFC Recurrence Control System," which define remedial and preventive actions relative to nonconformances; and

c. Replace S&E 5330.6, "MSFC Nonconformance Reporting System."

Filing Instructions:

File in a standard 3-ring binder in numerical sequence w/o regard to the alphabetical prefix which identifies the type of issuance.

ED OCTOBER 1992)

N A S A
National Aeronautics and
Space Administration

MM 5330.10

George C. Marshall Space Flight Center
Marshall Space Flight Center, Alabama 35812

MSFC NONCONFORMANCE (DISCREPANCY) REPORTING SYSTEM

MSFC-Form 454 (Rev. October 1976)

Preface

Nonconformances (discrepancies) in Marshall Space Flight Center (MSFC) flight hardware/software, developmental items related to flight articles, ground support equipment items, and test anomalies are resolved through the use of an organized system of problem reporting, processing, and disposition. This document establishes procedures which supplement the requirements of MMI 5330.8 and MMI 5330.9.

(ORIG S/BY)

T. J. Lee
Director

Distribution:
SDL 2

Section Page

List of Figures

Abbreviations and Acronyms

ABCSS	As-Built Configuration Status System
CCB	Configuration Control Board
C/SC	Configuration/Spec. Change (ECR)
DAR	Deviation/Waiver Approval Request
DR	Discrepancy Record
DRS	Documentation Release System
ECR	Engineering Change Request
ESD	Electrostatic Discharge
FEO	Floor Engineering Order
GSE	Ground Support Equipment
GTO	Ground Test Use Only
IR	Inspection Report
P/N	Part Number
MM	Management Manual
MMI	Marshall Management Instruction
MRB	Material Review Board
MRC	Material Review Crib
QRC	Quality Record Center
Rpr	Repair
RTV	Return to Vendor
Rwk	Rework

Abbreviations and Acronyms
(Continued)

Scp Scrap

S&E Science and Engineering

S&MA/QA Safety and Mission Assurance/Quality Assurance

S/N Serial Number

SOP Standard Operating Procedure

SPEC Specification

SRP Standard Repair Procedure

STD Standard

STE Special Test Equipment

T/A Test Article

TCP Test and Checkout Procedure

TDR Test Discrepancy Record

TPD Test Procedure Deviation

TPS Test and Preparation Sheet

T/S Troubleshooting

UAI Use-As-Is

Wvr Waiver

MSFC NONCONFORMANCE (DISCREPANCY) REPORTING SYSTEM

1. PURPOSE

To establish the procedures for recording, processing, and maintaining records of Marshall Space Flight Center (MSFC) nonconforming articles, materials, parts, assemblies, and systems (items) that are received, manufactured, modified, or tested at MSFC.

2. APPLICABILITY

2.1 General

This manual is applicable to all MSFC organizations.

2.2 Limitations

a. This manual is limited to recording and resolving nonconformances for the following:

(1) Items which are released into the MSFC Documentation Release System (DRS), including the following:

(a) Flight hardware/software.

(b) Qualification hardware/software.

(c) Ground Support Equipment (GSE) or Special Test Equipment (STE) which (1) supports post-manufacturing acceptance tests of flight hardware, (2) interfaces with test articles undergoing certification/qualification testing, and (3) supports preflight, postflight, and flight operations.

(d) Portions of the system which will be applied to STE nonconformances detected during required Safety and Mission Assurance/Quality Assurance (S&MA/QA) surveillance operations supporting STE manufacturing, installation, or facility certifications.

(e) Special handling equipment that interfaces with flight or qualification test hardware.

(2) Other hardware/software which has not been released into the MSFC DRS, but designated by project management, the chief engineer, or Director, Science and Engineering Directorate (S&E).

b. Specifically excluded from the above are items which are usually not released into the MSFC DRS:

(1) Ground instrumentation systems for obtaining certification/qualification test data.

(2) Test facility platforms, ladders, load cells, shakers, standard handling equipment, etc.

(3) Test equipment used for component and subsystems qualification tests and acceptance bench tests.

(4) Off-the-shelf procured test equipment.

(5) Development test hardware/software except as noted in paragraph 2.2a(2).

3. REFERENCES

3.1 Publications

The following publications form a part of this document to the extent specified herein.

EG11.2 "Acceptance Reporting, Work Authorization Document Review, and Parts Tag Initiation Procedure"

EG 5330.13 "The Use of NASA Withhold Tags on Non-Conforming Hardware"

MMI 5330.4 "Deviation Approval Request Requirements"

MMI 5330.8 "MSFC Nonconformance (Discrepancy) Review System"

MMI 5330.9 "MSFC Recurrence Control System"

MMI 8040.19 "Engineering Change Requests"

MSFC-STD-555 "MSFC Engineering Documentation Standard"

MSFC-STD-1241 "Control and Disposal of Scrap Hardware and Materials"

3.2 Forms

This manual prescribes the use of the following MSFC forms.

MSFC Tag 6 "Squawk Tag"

MSFC Form 460 "Discrepancy Record" (Record Copy)

MSFC Form 4122 "Withhold Tag"

MSFC Form 460-1 "Discrepancy Record, Continuation Sheet"

MSFC Form 492 "Test Discrepancy Record Log"

MSFC Form 3959 "Test Procedure Deviation"

4. GENERAL PROVISIONS

The Squawk Tag (MSFC Tag 6) shall be used to document obvious/ simple rework which can be corrected without engineering disposition or detailed methodization (see Figure 1).

Discrepancy Record/Test Discrepancy Record (DR/TDR) (MSFC Form 460) shall be used to define all other noncon- formances to applicable drawings, specifications, tests, other requirements, or document test anomalies which occur during test operations. The DR is utilized for recording and dispositioning hardware/software nonconformances (see Figure 2). The TDR is utilized for recording and dispositioning test anomalies. If a test anomaly is determined to be a hardware/software nonconformance, a DR will be initiated (see Figure 3).

MSFC Form 460 is a multipurpose discrepancy record form that is also used to define recurrence prevention problems and dispositions in accordance with MMI 5330.9.

Squawk Tags and DR's/TDR's shall be evaluated and dispositioned as specified herein.

5. DEFINITIONS

Definitions for terms used in this manual are as follows:

a. Class I change criteria - See Figure 4.

b. Explainable Condition - A nonconformance reported by the initiation of a DR/TDR which, after investigation, proves to be a normal condition not requiring remedial action.

c. Performing Organization - S&E Laboratory elements responsible for operations (receiving, manufacturing, test, etc.,) and subject to S&MA/QA inspection or test monitoring activities.

d. Remedial Action - Action to correct a nonconforming article or material.

This figure is not available electronically at this time; a copy may be obtained from the Central Repository.

Figure 1. Nonconformance Routing (Squawk Tag)

This figure is not available electronically at this time; a copy may be obtained from the Central Repository.

Figure 2. Nonconformance Routing (DR)

This figure is not available electronically this time; a copy may be obtained from the Central Repository.

Figure 3. Nonconformance Routing (TDR)

This figure is not available electronically at this time; a copy may be obtained from the Central Repository.

Figure 4. Class I Change Definition

e. Repair - A procedure which makes a nonconforming item acceptable for use. The purpose of the repair is to reduce the effect of the nonconformance. Repair is distinguished from rework in that the characteristics after repair still do not completely conform to the applicable drawings, specifications, or contract requirements. Non-standard repair procedures are authorized by Material Review Board (MRB) action for use on a one-time basis only.

f. Rework - A procedure applied to a nonconforming item that will completely eliminate the nonconformance and result in a characteristic that conforms completely to the drawings, specifications, or contract require- ments. Includes both "incomplete operations" and "return to print" dispositions.

g. Standard Operating Procedure (SOP) - Describes the more routine or basic operations and guidelines which do not require the execution of detailed sequences of events at a specific test site.

h. Test Article (T/A) - Flight end items (stages, spacecraft, modules, experiments, etc.) or test end items/systems undergoing certification/qualification/ acceptance/designated development testing at the subsystems/systems level.

i. Test and Checkout Procedure (TCP) - Defines the detailed sequence of events to perform a specific test or operation on the test article.

j. Test Preparation Sheet (TPS) - A document which authorizes and describes test activation/operation and associated manufacturing tasks not previously authorized by a released procedure or a DR/TDR.

k. Unexplained Condition - Category of TDR closure. The specified problem/anomaly occurs only once or of such low frequency that all engineering efforts (troubleshooting, analysis, review of data, etc.) have been exhausted without determination of a causal factor. Management accepts the risk of closure without a finite resolution.

6. SQUAWK TAG

6.1 General Procedures

a. Disposition shall be by cognizant performing personnel. No work will be accomplished until the disposition has been entered. The work performed on a Squawk Tag shall be traceable to the individual performing the task.

b. If the Squawk Tag involves more than obvious/simple rework and requires detail methodization, S&MA/QA shall upgrade it to a DR.

c. A Squawk Tag may be voided by S&MA/QA prior to disposition by writing "VOID" across the Squawk Tag and stamping the Squawk Tag with the inspector's stamp.

6.2 Squawk Tag Form Instructions

The Squawk Tag (MSFC-Tag 6) is a two-part form consisting of a tear-out original and a hard-card tag to be attached to or remain with the nonconforming item until closure. All entries made on Squawk Tags shall be either typewritten or made with black ink (only) ball-point pen to facilitate legible copies. The Squawk Tag shall be initiated by the S&MA/QA inspector as follows:

Block No.	Entry Description
1	Pre-printed Squawk Tag Number.
2	Enter Part Number (P/N).
3	Enter Serial Number (S/N) if part has one.
4	Enter date.
5	Enter initiator's (inspector's) name.
6	Enter part name (abbreviate).
7	Enter reference designator of electrical part, if applicable.
8	Initiator shall enter a clear concise description of the nonconformance. For reference information, enter the unique number of the work authorizing document. Remove the original for office file and attach the hard-card tag to the nonconforming item.
9	Performing personnel shall enter a clear concise description of the rework to be performed. If the nonconformance turns out to be of such significance as to require initiation of a DR, the initiator references the DR number and closes the Squawk Tag. Completed Squawk Tags, or worked portions thereof, shall not be voided.
10	Signature/organization of the dispositioner.

11 Signature/organization of the individual performing rework.

12-13 S&MA/QA shall close the Squawk Tag, acceptance stamp block 12, date block 13, remove the Squawk Tag from the item, and file it with the record copy of the work authorizing document.

7. DISCREPANCY RECORD

7.1 General Procedures

a. MSFC Form 460,"Discrepancy Record," is a four-part form consisting of (1) the original Record Copy with a hard back, (2) Reliability Copy, (3) Quality Record Copy, and (4) Initiator's Copy.

b. Completion and processing of the nonconformance recurrence prevention utilizing the Reliability Copy 2 is described in MMI 5330.9.

c. A separate DR shall be initiated for each nonconformance, except that multiple nonconformances involving a single item of hardware at a single inspection point may be listed on one DR.

d. When an item is known "before-the-fact" to have a Configuration Control Board (CCB) approved deviation, the deviation shall be presented to S&MA/QA along with the item and its associated documentation to preclude initiation of a DR.

7.2 Transfer Action

If the performing organization cannot complete a remedial action, the performing organization's representative shall enter the following on the DR disposition:

"Transfer this DR to (organization) per notification by (organization and person's name) on (date)."

a. The performing organization's representative shall sign this step and submit for S&MA/QA acceptance stamping.

b. The S&MA/QA representative shall make a copy of the DR showing the transfer and forward the DR to the Quality Record Center (QRC). The QRC shall record the change of responsibility on the status log.

c. The performing organization shall forward the hardware and the DR to the new organization to which the responsibility has been transferred.

d. Other S&E laboratories shall provide remedial action for their area of responsibility for hardware transferred to their laboratory.

e. The chief engineer shall provide management resolution for "disputed" remedial action responsibility.

7.3 Voids and Changes to Dispositions

a. Completed DR's, or worked portions thereof, shall not be voided.

b. If a DR has been dispositioned, but the work has not been performed, the DR may be voided by the S&MA/QA supervision. The S&MA/QA supervision shall enter "VOID" and state the reason in the disposition section above the Final Acceptance block 34 of the DR. S&MA/QA shall sign the statement and obtain the engineering signature from the same or higher supervision level than original disposition approval.

c. DR's which have not been dispositioned may be voided by the S&MA/QA supervision with this same process, but do not require engineering signatures.

d. When a disposition voids, deletes, or changes any unworked portion of a DR, a notation shall be made next to the voided, deleted, or changed paragraphs, and S&MA/QA shall stamp adjacent to the notation.

7.4 Emergency Processing

a. A nonconforming item on which a DR is awaiting MRB review or waiver disposition by the CCB may, at the discretion of the chief engineer, continue through hardware processing operations pending formal disposition, under the following conditions:

(1) A written order to proceed is provided by the chief engineer.

(2) There is no safety risk resulting from continued processing of the nonconforming part.

(3) The order to proceed includes a recovery plan if the proposed disposition is disapproved. This may include limits on processing steps prior to formal disposition.

b. Advance implementation of work proposed via an Engineering Change Request (ECR) may be implemented prior to the CCB disposition by utilizing a Floor Engineering Order (FEO) in accordance with MSFC-STD-555.

7.5 Withhold Tag and Material Review Crib

A Withhold Tag (MSFC Form 4122) shall be attached to nonconforming items (EG 5330.13) scheduled for review by the MRB or waiver disposition by the CCB when the item will not be moved to the Material Review Crib (MRC). When an item is placed in the MRC with the DR, a Withhold Tag is not required.

7.6 Parts Tag, MSFC Form 312

a. Dispositions of use-as-is, repair-to-standard repair, repair-to-nonstandard repair procedure, or authorized per previously approved Deviation/Waiver Approval Request (DAR) shall be identified in the manufacturing build paper, in the as-built listings, and on the parts tag.

b. All information concerning an item of hardware shall be entered on the parts tag in accordance with EG11.2 to support the As-Built Configuration Status System (ABCSS).

c. For parts downgraded from flight status, the effectivity shall be changed accordingly on the parts tag.

7.7 Initial Review

The following DR dispositions may be made, proposed, or requested via an Initial Review by the performing and design organizations:

a. Scrap, Return-to-Vendor (RTV), or rework. (Note: An RTV or scrap disposition shall require coordination with the project office having funding responsibility for the discrepant part.)
b. Request MRB disposition.

c. If it is determined that Class I (Figure 4) change criteria is affected, a DAR shall be prepared per
MMI 5330.4.

d. If an engineering problem is indicated, an ECR, in accordance with MMI 8040.19, shall be prepared and submitted to the applicable CCB for disposition.

7.8 Material Review Board

a. For DR's not impacting Class I change criteria, the following dispositions may be made by an MRB:

(1) Use-as-is.

(2) Repair per standard or nonstandard repair procedure.

(3) Downgrade to nonflight status.

(4) Apply all dispositions listed in paragraph 7.7 above.

b. MRB approval shall be denoted by the dated signatures and office symbols of each voting member at the end of the disposition. All MRB dispositions shall be written on or attached to the DR for the nonconforming item undergoing review.

c. When unanimous approval by all voting members cannot be reached on a disposition other than scrap, the dissenting member(s) shall denote their rationale on the DR, and it shall be submitted to the appropriate chief engineer for final resolution.

d. The DR shall serve as the record of the MRB disposition and, upon closure, shall be forwarded to the S&MA/QA Records Center by the S&MA/QA personnel making final acceptance of the DR.

e. All repair procedures shall be approved by the MRB. Standard Repair Procedures (SRP's) shall consist only of those authorized by the S&E director as official institutional SRP's applicable to all projects or those authorized by a CCB as official project unique SRP's applicable to that project. All SRP's shall contain specific definitive application criteria.

7.9 Configuration Control Board

For DR's impacting Class I change criteria, the CCB may disposition the DAR using any of the dispositions listed in paragraph 7.8.a. above.

7.10 Discrepancy Record Form Instructions

7.10.1 All entries made on DR's shall be either typewritten or made with black ink (only) ball-point pen to facilitate legible copies. MSFC Form 460, Discrepancy Record, shall be initiated by S&MA/QA as follows:

Block No.	Entry Description
1	Enter TDR number if DR resulted from a TDR.
2	Enter page numbers; leave "of ____" blank until closure, then enter total number of pages.
3	Enter part name of nonconforming item.
4	Enter part number of drawing and drawing revision.
5	Enter S/N of item, or if none, use lot number or leave blank.
6	Enter Engineering Parts List number and revision.
7	Number pre-stamped (for DR only).
8	Enter reference designator of item.
9	Enter measurement number if available.
10	Enter the manufacturer or supplier of part.
11	Enter part effectivity number; example: F04, F05, etc. (Redshift Qual. Unit, Redshift Flight Unit)
12	Enter parts tag number (previously Inspection Report [IR] Tag) (see paragraph 7.6).
13	Enter name of next higher assembly.
14	Enter part number of next higher assembly.
15	Enter three-letter code identifying the operation in progress when nonconformance was detected.

Operation	Code
Development Test	Dev
Qualification Test	Qal
Manufacturing and Assembly	Mfg
Acceptance Test	Acc
Receiving	Rec

16	Reference the document and its number (if applicable) to which the inspection/test is being performed, such as TCP-5600, DR-2042, TDR-001-3, W.O., etc.
17	Enter program affected.

18-19 Leave blank.

20 Check applicable block for nonconforming item's hardware category.

21 Starting with 1, enter consecutive numbers for each nonconformance being entered in the discrepancy space.

22 Leave step and time spaces blank. Enter clear, concise description of the nonconformance or for each nonconformance for multiple nonconformances. Use MSFC Form 460-1 or additional space numbered pages 1A, 1B, etc., as required. At end of description enter "Requested by (name of individual requesting DR)", if appropriate.

23 Signature of initiator.

24 Enter initiator's organization symbol.

25 Enter name of test conductor or supervisor of personnel performing the last operation.

26 Enter QC acceptance stamp number and stamp record copy.

27 Enter date of inspection.

7.10.2 Remove RC and QRC and mail/or forward to Problem Assessment Branch and the Quality Records Center, respectively. Retain initiator's copy for personal record. Place DR in Electrostatic Discharge (ESD) protective holder and attach to part. Request initial review and disposition from cognizant technical and performing organization's representatives:

Block No. Entry Description

28 Dispositioner enters next sequential number of disposition being entered in block 29 starting with number 1.

29 Dispositioner enters remedial action dispositions sequentially in accordance with paragraph 7.10.3.

7.10.3 Dispositions for block 29 entries are as follows:

a. DR closure dispositions must be entered on pages 1, 1A, 1B, etc., as appropriate.

b. Leave pre-printed dispositions blank.

c. For "Explainable Condition" DR's, engineering rationale for why no nonconformance exists must be included in the closure disposition.

d. On dispositions of "Scrap" (in accordance with MSFC-STD-1241) where the value of item(s) being scrapped exceed $2500, enter the disposition engineer's division chief approval.

e. Items dispositioned as RTV shall be returned to the vendor through the contracting officer in accordance with the contract.

f. All approved dispositions on DR's shall contain complete instructions or a reference to the instructional document used. All referenced documents used shall have the S&MA/QA acceptance copies attached to the DR upon completion. When applicable, drawings and specifications shall be referenced. All repair work shall be acceptance stamped on the DR. Any additional inspection requirements shall be identified on this DR.

g. All unique safety requirements not specified in existing procedures shall be defined.

h. When parts are to be removed for repair or replacement with a like item, the disposition shall reference or specify repair and handling requirements. If the removal is temporary, the DR shall also provide directions for reinstallation.

i. When a nonconformance involves a functional failure of a part, component, or assembly, the DR disposition shall require a failure analysis, and the results shall be included with the DR.

j. Requirements for retest shall be specified when a functional component or part has been invalidated (i.e., replacement of parts(s), disconnecting wires, etc.). The DR will remain open until the retest has been satisfactorily completed and a summary statement added to the DR.

(1) The retest procedures shall be specified on the DR (or TDR if one has been prepared) or reference made to an issued test procedure which shall accomplish the retest.

(2) If no retest is required, the closing disposition shall state this fact.

k. During the test operation, the determination of whether any DR is constraining or not constraining to the start and/or the continuation of test activities is the responsibility of the test conductor/engineer. Therefore, remedial action may be delayed to a later time for those DR's for which the test conductor/engineer has entered the disposition: "This DR is not a constraint to testing."

7.10.4 All dispositions shall be identified to the person(s) making the dispositions by name, organization and date.

Block No. Entry Description

30 Enter performing individual's organization, signature or stamp for the step being performed.

31 Enter inspector's Acceptance Stamp and date for each work step.

32 Dispositioner checks applicable block, enters appropriate item number, and routes item to and/or notifies the MRC. See paragraph 7.5 for instructions on Withhold Tags.

35 Leave blank.

33-34 Acceptance and closure of DR's shall be
36 made only after (1) all rework is accomplished, (2) any required retests are performed, (3) all associated documentation is attached (i.e., photos, waivers, etc.), (4) other appropriate dispositions have been completed, and (5) their acceptance by S&MA/QA accomplished. DR closure shall consist of S&MA/QA acceptance stamping and dating of the final acceptance block and, in block 33, circling the appropriate summary block of the remedial action performed. Block 33 final disposition summaries are as follows:

Block No. Entry Description

1. "Rpr"-Repair

2. "UAI" - Use-As-Is

3. "GTO" - Ground Test Use Only

4. "Rwk" - Rework to drawing/specification

5. "Wvr" - Request for waiver of requirements (see MMI 5330.4)

6. "RTV" - Return to Vendor

7. "Scp" - Scrap

8. "C/SC" - Configuration/Spec. Change (ECR)

9. "Other" - (Use this for two or more of the above and for Explainable/Unexplainable Conditions)

7.10.5 All DR's shall be dispositioned and closed. The closed Record Copy of each DR is forwarded to the Quality Records Center for filing and retention.

7.11 Discrepancy Record Continuation Form Instructions

MSFC Form 460-1 shall be initiated when required:

Block No.	Entry Description
1-2	Leave blank.
3	Enter page number leaving "of ___" blank until closure, then enter total pages.
4-5	Leave blank.
6	Enter DR number from page 1.
7	Enter next sequential number of entry being made. Use large center space for all troubleshooting, summaries, work operations, etc. Closure dispositions will only go on pages numbered 1, 1A, 1B, etc., as appropriate.
8	Enter performing individual's organization, signature or stamp.
9	Enter S&MA/QA acceptance stamp/date of all work steps.
10 & 12	After acceptance of all page items, enter S&MA/QA final acceptance date and stamp.
11	Leave blank.

8. TEST DISCREPANCY RECORD

8.1 General Procedures

8.1.1 A TDR is initiated using MSFC Form 460 any time a problem/anomaly is encountered during T/A or GSE subsystems/systems testing. An obvious test procedure deviation or human factor which is immediately recognized and corrected without disturbing the normal progress of the test is an exception that does not require a TDR.

a. Whenever an anomaly occurs during test operations, the test engineer shall notify the test conductor/ supervisor. The engineer then reviews the Test Plan (TCP, etc.) and the available data to determine if a human factor or procedure error is the cause of the anomaly. If the cause is attributed to a procedure error, then deviations or mod sheets (paragraph 8.4.2.1) must be prepared and executed to correct the anomaly. If the cause is a human factor which did not result in any damage or configuration change to the T/A or GSE and a simple recycle of a step or two will correct the anomaly, then no deviation is required.

b. The steps that are rerun shall be annotated by S&MA/QA as Run 2 in the margin of the TCP page along with the reason for the rerun. If the recycle requires steps not contained in the procedure (i.e., reset a switch that was operated in error), then a deviation (paragraph 8.4.2.1) is required before testing can be continued. If, after a brief review, the engineer cannot attribute the anomaly to human factor or procedure error and correct the anomaly, then a TDR shall be initiated. See Figure 3 for flow diagram.

8.1.2 TDR's shall normally be initiated by the test personnel performing a test. However, S&MA/QA may initiate a TDR or DR when, in their opinion, a condition warrants documentation.

8.1.3 TDR's and MSFC Form 3959, Test Procedure Deviations (see paragraph 8.4.2.1), not impacting Class I change criteria shall be dispositioned by the cognizant engineering personnel in the testing organization where the TDR was originated. If a TDR/test anomaly is determined to be caused by a hardware/software configuration nonconformance, a DR will be initiated. When approval of a nonconformance impacting Class I change criteria to a baselined test requirement is desired, a DAR (MMI 5330.4) will be required.

8.1.4 TDR's shall be entered into MSFC Form 492, Test Discrepancy Record Log (paragraph 8.6) to provide traceability. TDR log entries shall be closed when each TDR is closed, and completed logs and TDR's shall be placed in S&MA/QA QRC along with the "as-run" test procedure.

8.1.5 Guidelines for processing the TDR's are as follows:

a. Initiation - The initiator shall complete an unnumbered MSFC Form 460 through the preprinted checkoff section in block 29 and enter the TDR number on the TDR log.

b. Initial Disposition - Test engineering personnel shall make one of the following initial dispositions:

(1) Troubleshoot per continuation sheet.

(2) Transfer to (organization) for troubleshooting.

(3) No troubleshooting required with engineering rationale, description of remedial action taken, statement of retest, and TDR closure and categorization statement.

8.2 Test Discrepancy Record Troubleshooting Operations

a. When test article and/or GSE troubleshooting (T/S) are required, the troubleshooting steps shall be entered and approved on DR Continuation Sheets (MSFC Form 460-1). Troubleshooting may then be initiated.

b. For all tests being monitored by S&MA/QA personnel, no T/S may be conducted without S&MA/QA coverage.

c. The test engineer shall sign and date each step, or group of steps, before they can be run. When monitoring this type of troubleshooting operation, S&MA/QA shall assure that the engineer has signed each step, or series of steps, before giving his approval to proceed. Should engineering not follow this procedure, S&MA/QA shall not accept the steps.

d. If test engineering wants to delete certain steps that have been written, but not executed, then an additional step shall be added directing the deletion of these steps. The unwanted steps shall not be lined out. S&MA/QA shall write the word "deleted" in the "worked by" column adjacent to the specified steps and by the steps. S&MA/QA shall then close the step directing the deletion.

e. As each T/S page of the TDR is completed, test engineering shall sign and date the page, and S&MA/QA shall accept the page. S&MA/QA acceptance is required on T/S work steps and dispositions.

f. If, during TDR T/S operations, other anomalies are discovered not attributable to the same cause as the initial TDR anomaly, then new TDR's shall be initiated against the same test documentation (TCP, TPS, DR, etc.) that the initial TDR was written against.

g. If excerpts from other documents, i.e., TCP's, SOP's, TPS's, etc., are to be used as a part of the T/S operations, a T/S step must authorize and define the excerpt: Example, "Perform Attachment A, 6 pages." If the attachment contains portions which have been changed in any way from the original copy, then a reproduction of the changed copy shall be used for record purposes. All attachment pages shall be acceptance stamped by S&MA/QA in the lower right hand corner under a diagonal slashed line, and each page of the attachment shall be signed by test engineering.

h. A utility sequence may be authorized by a T/S step without requiring an attachment: Example, "Perform Sequence 3 of KT-1109."

i. When the problem has been isolated, the engineer shall summarize his conclusion in a T/S summary defining the problem and sign and date the summary. The T/S summary does not require S&MA/QA approval.

j. If the anomaly is caused by hardware/software configuration nonconformance, a DR shall be prepared per this Manual.

8.3 Test Discrepancy Record Retest Requirements

a. When all T/S and/or disposition operations are complete, the test engineer shall address retest requirements. If a breakout box was installed, flight cables disconnected, or fluid connections broken, then the affected systems shall be retested. In the case of an electrical connector disconnected, each copper path in the "broken" circuit shall be reverified. If retesting is performed after parts replacement or rework, retest requirements and instructions shall be provided. If retest is to be accomplished at a later date, a disposition statement specifying the retest shall be included, such as, "Retest shall be accomplished by KT-7002, Sequences 2, 3, and 4."

b. If no problem is found during T/S, the retest disposition statement should read, "Retest satisfactorily accomplished in Step X through XX."

c. No TDR shall be closed until the retest has been satisfactorily completed and a disposition added to the TDR stating that the retest was satisfactory.

d. All functional TDR anomalies require satisfactory retest for TDR closure.

e. If no retest is required, then a disposition shall be included in the TDR giving the rationale for "no retest."

8.4 Test Discrepancy Record Form Instructions

8.4.1 MSFC Form 460 shall be initiated as a TDR in accordance with paragraph 8.1:

Block No. Entry Description

1 Enter next sequential number from TDR Log maintained with the Record Copy of the TCP, TPS, etc. See paragraph 8.6.

2 Enter page number and circle sheet number as pages are added. Enter page X of XX only at closeout so that total number of pages will be correct.

3-8 Leave blank.

9 Enter measurement number if applicable.

10 Leave blank.

11 Enter effectivity of item under test; i.e., F04 (Redshift Flight Unit).

12-14 Leave blank.

15 Enter three-letter code identifying the operation in progress when nonconformance was detected.

Operation	Code
Development Test	Dev
Qualification Test	Qal
Manufacturing and Assembly	Mfg
Acceptance Test	Acc
Receiving	Rec

16 Enter number of test documentation (TCP, TPS, DR, etc.) being conducted.

17 Enter subsystem.

18-20 Leave blank.

21 Enter next consecutive number of anomaly being entered when more than one similar anomaly is being recorded.

22 Enter test procedure step and clock time of anomaly occurrence. Enter clear, concise description for each anomaly.

23 Name of initiator.

24 Organization of initiator.

25 Signature of test conductor or supervisor of personnel performing the last operation.

26 Leave blank unless initiated by S&MA/QA personnel.

27 Date of initiation.

28 Enter next consecutive number of each and every separate step of disposition, instruction, troubleshooting step, summary, etc., starting with Step 1.

29 Disposition: When a TDR is generated, test engineering is to enter dispositions in accordance with paragraph 8.4.2.

8.4.2 Dispositions for block 29 entries are as follows:

a. If the problem constrains test operations, check "Yes" and enter the event or number of the test which is constrained by the condition documented.

If the problem does <u>not</u> constrain test operations, check "No."

b. Check appropriate block to indicate whether or not the disposition included hazardous operations. Sign and date in space provided.

c. T/S Plan Req. - Leave blank.

d. Enter initial disposition per paragraph 8.1.5b.

e. When the source of the problem/anomaly has been identified, enter a summary of T/S clearly identifying the source of the anomaly.

f. Enter any required remedial action dispositions.

g. Enter any required retest dispositions and statements.

h. Number the steps consecutively and key the steps to the corresponding item of the nonconformance entry.

i. Enter appropriate TDR "closure" disposition (see paragraphs 8.4.2.1 through 8.4.2.7).

8.4.2.1 The closure instructions for "Procedure Error" are as follows:

a. If T/S indicates the problem to be caused by procedure error, the closure disposition of the TDR must reference the permanent deviation/mod sheet, MSFC Form 3959, Test Procedure Deviation (TPD), or requirements waiver which corrects the procedure error: Example, "TPD 23 written to correct procedure. Close this TDR as a Procedure Error."

b. When closing a TDR in this way, the test engineer should be sure that the deviation correcting the procedure was run, either in the procedure or as portions of the troubleshooting activities. This retest is required to prove that there was in fact a procedure error. Unless this is done, the deviation will not be accepted by S&MA/QA for incorporation into the procedure.

8.4.2.2 The closure instructions for "Human Factor" are as follows:

If a human factor is determined to be the cause of the anomaly, then the closure disposition must state that no test article or GSE damage occurred as a result of the anomaly. (If an anomaly caused by human factor requires rework, modification, or repair, then a DR must be initiated against the hardware affected.) The final statement should be "Close this TDR as Human Factor." Reference paragraph 8.4.3, blocks 34 and 36g.(3) for additional signatures.

8.4.2.3 The closure instructions for "Explainable Condition" are as follows:

If the nonconformance documented on the TDR after investigation or T/S proves to be a normal condition not requiring remedial action, then the TDR may be closed as an explainable condition. The T/S summary or engineering conclusion should provide a clear concise explanation of the condition and state that there is no effect on system performance. The final disposition should be "Close this TDR as an Explainable Condition." Reference paragraph 8.4.3, blocks 34 and 36g(3) for additional signatures.

8.4.2.4 The closure instructions for "Facility" are as follows:

If the troubleshooting indicates the problem is "nonsupport" from a facility, the test engineer will report the trouble to the appropriate facility support organization and obtain remedial action. Once remedial action has been accomplished and a satisfactory retest accomplished, the closure disposition should be "close this TDR as a facility problem."

8.4.2.5 The closure instructions for "T/A or GSE Hardware" are as follows:

If troubleshooting determines the cause of an anomaly to be in a T/A or GSE (assembly, subassembly, component, cable, etc., or test requirement), S&MA/QA is to be notified to initiate a DR against the nonconforming item. All removal, replacement, reinstallation, and system retest instructions will be a part of the TDR dispositions.

However, all actions performed on the item as a separate entity will be defined and executed on the DR. The TDR must reference the DR number initiated and the S/N of the nonconforming item.

a. If the item is removed for remedial action and later reinstalled, then the TDR must remain open until reinstallation and a satisfactory retest is accomplished.

b. If the item is removed and is to be replaced by a spare item, then the TDR must reference the DR number and S/N of the nonconforming item and also the S/N of the replacement item. Once replacement has been accomplished, the TDR may be closed upon satisfactory completion of a retest.

c. Other work operations are permitted to provide remedial actions on TDR's limited to the following cases:

(1) Incorporation of an Engineering Order in GSE or flight article under test.

(2) Incorporate adjustments/work order, TPS, or other test.

(3) Standard adjustments/calibrations on certification test GSE and in-place adjustments/calibrations to acceptance test GSE.

In these cases, the TDR will remain open until the work operations have been completed, a satisfactory retest has been accomplished, and the closure disposition references all associated documentation (such as a work order, TPS, or engineering order) which was implemented to correct the condition.

8.4.2.6 The closure instructions for "Unexplained Condition" are as follows:

When all troubleshooting possibilities have been exhausted with no definite conclusion as to the cause of the anomaly, the TDR can be closed as an "Unexplainable Condition" by all of the following:

a. A statement by the test engineer that cause cannot be established, and a statement describing the most likely cause.

b. Inclusion by the design organization's designee of the risk assessment with TDR closure, and the potential failure modes and any possible effect on missions.

c. A closure disposition of "Close this TDR as an Unexplainable Condition" approved by the appropriate chief engineer.

8.4.2.7 The closure instructions for "Computer" are as follows:

If troubleshooting indicates the anomaly to be due to hardware/software problems with a ground computer, then the TDR can be categorized as a "Computer Problem." The closure disposition should reference the documentation that corrected the problem with the computer and state "Close this TDR as a Computer Problem."

8.4.3 The instructions for "Acceptance" are as follows:

Block No.	Entry Description
30	Performing individual initials or stamps all work steps performed.
31	S&MA/QA will enter acceptance stamp/date for all work steps performed acceptably.
32-33	Leave blank.
35	Leave blank.
34 & 36	Final Acceptance - Prior to final acceptance stamp/date block 36 of each TDR, S&MA/QA will assure that each item in the following checklist has been accomplished:

a. Block 1 has been annotated with numbers of all additional pages.

b. All dispositions have been accepted by S&MA/QA.

c. Each work step has been accepted by S&MA/QA.

d. Each "continuation" sheet has been accepted by S&MA/QA.

e. Engineering has signed/dated each step, or group of steps of troubleshooting, and the bottom of each troubleshooting page was signed/dated by the engineer.

f. A troubleshooting summary was written and signed/dated by the engineer.

g. All the necessary approval signatures are present:

1) Performing organization personnel designated to make engineering dispositions or the appropriate chief engineer.

2) On TDR's containing hazardous operations which increase the hazard

level of the test operations being conducted (i.e., TCP, TPD, DR, etc.), Safety approval has been obtained.

3) On TDR summaries concluding the problem to be an "Explainable Condition" or on TDR's to have been due to a "Human Factor," approval of dispositioning engineer's branch chief or the test conductor/supervisor has been obtained.

h. All necessary supporting documents and/or data sheets are attached.

i. A retest statement has been made.

j. A final summary and closure disposition have been made.

8.5 Test Discrepancy Record Filing

The closed TDR (Record Copy) and continuation sheets shall be filed in the S&MA/QA QRC with their logs and the Record Copy of the TCP, TPS, DR, etc. Only the Record Copies shall be filed. Other copies may be discarded.

8.6 Test Discrepancy Record Log Form Instructions

MSFC Form 492, Test Discrepancy Record Log, shall be used to log all TDR's initiated against each separate test document being conducted (i.e., TCP's, TPS's, Retest DR's, etc.). The form shall be completed as follows:

Block	Entry Description
DOCUMENT	Enter unique number of document being conducted (i.e., TCP-KT001, TPS-A1042, etc.).
RUN NO.	Enter run number of TCP if applicable.
T/A	Enter name/designation of article under test.
S/N	Enter serial number of T/A.
PAGE__OF__	Enter pages of log as appropriate.
TDR NO.	Enter sequential number for each TDR initiated starting with number 1. The full TDR number is the document number followed by a dash and the number from this block. Examples of TDR numbers:

(a) DR's - 8042-3 (third TDR against this DR).

(b) TCP's - KT-0001-10 (tenth TDR against TCP KT-0001).

(c) TPS's - A1320-2 (second TDR against this TPS).

Block No.	Entry Description

PROBLEM	Enter brief description of (Description)problem/anomaly.
DR NO.	Enter DR number for all DRs resulting from each TDR.
ENTERED BY	Enter stamp/date of log entry.
CLASSIFICATION	Enter stamp of individual closing TDR in the appropriate problem/anomaly category block.
CLOSED	Enter stamp of individual closing TDR and date of closure.